*Environmental Health Perspectives*
*Vol. 53, pp. 181-183, 1983*

**Commentary**

# Asbestos in Drinking Water: A Status Report

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**The conference is briefly reviewed in the light of its impact on future regulatory decisions regarding the possible control of asbestos fiber in drinking water.**

**The results of animal feeding studies indicate that asbestos fails to demonstrate toxicity in whole-animal lifetime exposures. The epidemiologic evidence of risk from ingestion of water containing asbestos fibers is not convincing, and in view of the lack of confirmation by animal studies, the existence of a risk has not been proven; however occupational gastrointestinal cancer may indicate ingestion risk.**

**Whether or not there is a risk from asbestos in drinking water, however, common sense tells us to deal with an undesirable situation by employing means that are commonly and economically available. Well-known methods can minimize the presence of asbestos fibers in finished drinking water. In the case of natural fiber in raw water, standard or augmented filtration practices are extremely effective. If the source of asbestos fiber is asbestos-cement pipe that is being attacked by corrosive water, then, there is more than sufficient economic reason to correct the corrosivity of the water.**

I have been asked to make some observations about the direction of activities in the United States and the Environmental Protection Agency in dealing with asbestos contamination of drinking water. I will also comment on this conference as it relates to those activities. My discussion will be confined to "where do we go from here" in the context of the Safe Drinking Water Act, which controls decision-making regulatory activities affecting drinking water contaminants.

The debate on asbestos and the human risk from ingestion of asbestos fibers has been going on since at least 1971 (*1–3*). One of the earliest questions to be asked was, in the light of the clear carcinogenesis of inhaled asbestos, what is EPA's regulatory posture related to ingested asbestos from drinking water? Our response, at that time, was that we did not feel that there were sufficient data on which to make a judgment on the risk. We recommended, however, that where asbestos fibers were found in drinking water, some of the many available means for minimizing fiber concentrations should be utilized to avoid unnecessary exposure.

The issue has ripened considerably since then. Virtually all of the data, including the results of research on epidemiology and animal feeding studies, transport phenomena, and *in vitro* studies, have been summarized in this program. Very few other issues have had the volume and intensity of study and resultant information that has been presented here, and there is no question that the importance of the issue warranted that much attention. Based on all of the information, and in the context of the Safe Drinking Water Act, we have to answer a few questions. First, is there a risk associated with the ingestion of asbestos fibers in drinking water? Second, if so, what is the magnitude of that risk? Finally, if it turns out that the risk, if any, is of sufficient magnitude, what kind of judgment should EPA make in a regulatory context?

My understanding of the animal and human epidemiology data, based on the discussions of this meeting, is that there is a substantial question as to whether there is a risk at all from small amounts of asbestos fibers in drinking water. On the other hand, if there is a risk, the magnitude of that risk must be quite small at fiber levels typically found in drinking water or perhaps even at atypical levels, such as the 100-million-plus fiber per liter concentrations.

There have been several analyses that have attempted to estimate the upper limit of that risk, and one of these was performed in 1980 (*4*). Extrapolations were made from the occupational

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inhalation data to project gastrointestinal intake, and several fairly tenuous conservative assumptions were included in that analysis. One of the estimates indicated an approximate upper excess risk of one in 100,000 per lifetime for gastrointestinal cancer at 300,000 fibers/L for 2 L water ingested per day for 70 years. The available data indicate that substantial populations are exposed to this concentration of fibers in drinking water in the United States and Canada; approximately 5 to 10% of the population in this country may be consuming asbestos-containing water at that level. The fundamental question is, though, does this constitute a significant risk? If it is a real risk, then what is the evidence that indicates the existence of that risk and what is the best quantitative estimate of the risk?

Under the provisions of the Safe Drinking Water Act, the choices EPA has are: (a) to regulate by providing some sort of legal limit: (b) not to regulate, but to provide guidance (which often is well received and followed); (c) or to conclude that there are not sufficient data on which to base regulations or provide guidance. If EPA were to regulate, the options would be to establish a numerical limit, called a maximum contaminant level (MCL) expressed in terms of a fiber count, or mass, or to require the application of one or more specific treatment processes known to be capable of reducing the fiber concentration. Either of these approaches would establish a ceiling on the amount of asbestos that could be present in drinking water in a given situation. The decision on alternative approaches, by law, must be based on the availability and feasibility of analytical methodology. The previous discussions have indicated that the analytical technology, although existing in certain sophisticated laboratory settings, is probably not widely available to public water systems, so perhaps there are other approaches to be taken if a limit is necessary.

The results of animal feeding studies as presented, including the National Toxicology Program study, indicate essentially that no toxicity was demonstrated in whole animal lifetime exposures (*5,6*). In the epidemiology studies, it appeared that in the one ecological study where there was some apparent correlation between asbestos fiber concentration and cancer risk, there were some confounding factors that had not been, or could not be, considered in that particular case, thus rendering the correlations questionable (*7,8*). Reanalysis of the data (*9*) seemed to produce anomalous results when San Francisco (city) populations were differentiated from others. A case-control study (*10*), using a smaller sample population, in the Pacific Northwest, apparently did not detect the existence of a measurable risk due to exposure to asbestos fibers at a level much higher than that found in the ecological study in the Bay Area of California. It can be said, then, that the epidemiologic evidence of risk from ingestion of water containing asbestos fiber is not convincing, and that, in view of the lack of confirmation by animal studies, the existence of a risk has not been satisfactorily demonstrated. There remains, however, the vexing question of the gastrointestinal cancer risk reported from occupational exposure studies (*11*).

There apparently is some migration of asbestos fibers *in vivo*. There also apparently are chemical transformations that occur in the gastrointestinal tract—transformations that probably do not occur in the respiratory area. This might explain apparent differences in the toxicology of asbestos depending on the route of exposure. The *in vitro* mutagenicity studies appear to be for the most part negative, but there does appear to be some element of cocarcinogenicity of asbestos with some polycyclic aromatic hydrocarbons. This situation is one that might call for additional study.

In order to make a decision on the regulation of absestos in drinking water, EPA must consider all of the available information, not only the credibility and magnitude of the risk, but also the analytical science, the treatment technology and the cost of control. Within the context of the Safe Drinking Water Act, the mechanism for making the decision is operating right now.

An Advance Notice of Proposed Rulemaking (ANPRM) will appear in the *Federal Register*. This ANPRM relates to EPA's total revision of the existing National Primary Drinking Water Regulations and the possible inclusion of additional contaminants in Revised Primary Regulations; asbestos is one of several candidates to be mentioned in the ANPRM. There will then be several workshops, a public meeting, and other opportunities to debate the issue. The ultimate decision goes beyond science and calculations—it becomes a function of a social judgment in the context of the Safe Drinking Water Act in terms of the appropriate decision based upon a weighing of all of the available information.

The next step in the regulatory development process is to decide on whether to propose a regulation. That decision will probably be made in early 1984. In the meantime, in addition to the proceedings of the workshops, advice will be available from the Safe Drinking Water Committee of the National Academy of Sciences which is now reviewing the matter for the Office of Drink-

ing Water. While sufficient data on which to base a decision may not have been available in the past, it appears that we are now at a point where there is adequate information along with the appropriate mechanism for reaching a decision in a reasonable period of time.

The issue of asbestos in drinking water falls into the same category as most of the environmental contamination issues. We never have the absolute, unequivocal yes/no answer, but of all the issues that we have examined in the past, the asbestos research has probably produced more hard data than the others. Therefore, I believe we will be able to make a good decision based on the current facts.

Water that is corrosive toward any element in a public water system is likely to be unacceptable for both economic and public health reasons. Apart from the forthcoming regulatory decision and regardless of whether there is a demonstrated risk from asbestos in drinking water, common sense tells us to deal with an undesirable situation by employing means that are commonly available, and to do so economically. Well-known methods are available to minimize the presence of asbestos fibers in finished drinking water. In the case of natural fiber in raw water, standard or augmented filtration practices are extremely effective. There are many good reasons why surface water should be filtered, and the presence of asbestos is just one more of them. If the source of asbestos fiber is asbestos-cement pipe that is being attacked by corrosive water, then there is more than sufficient economic reason to correct the excessive corrosive action of the water on the pipe.

Additional extensive research is not likely to shed much more light on the question of the risks of asbestos in drinking water. It is EPA's responsibility to make a decision using the data that we now have; it is the water industry's responsibility to provide drinking water for its customers that is as safe and wholesome and as free from adulterants as can be economically achieved using filtration or corrosion control techniques that are readily available.

The research described in this paper has been peer and administratively reviewed by the U.S. Environmental Protection Agency and approved for presentation and publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

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